UKTAG TRANSITIONAL WATER ASSESSMENT METHODS
FISH FAUNA

TRANSITIONAL FISH CLASSIFICATION INDEX (TFCI)

by

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(WFD-UKTAG)

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HEALTH AND SAFETY STATEMENT

WARNING— working in or around water is inherently dangerous; persons using this standard should be familiar with normal laboratory and field practice. This published monitoring system does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate health and safety practices and to ensure compliance with any national regulatory guidelines.

It is also the responsibility of the user if seeking to practise the method outlined here, to gain appropriate permissions for access to watercourses and their biological sampling.

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1. INTRODUCTION

This method statement describes a monitoring system for monitoring, assessing and classifying transitional waters in accordance with the requirements of Article 8; Section 1.3 of Annex II; and Annex V of the Water Framework Directive (2000/60/EC).

1.1. Geographic application of the method

The method can be applied to transitional waters in England, Northern Ireland, Scotland and Wales.

1.2. Quality element assessed by the method

The method enables an assessment of the condition of the quality element, "fish", in transitional waters.

1.3. Pressures to which the method is known to be sensitive

The method has been designed to detect the impact on the quality element of a wide range of pressures.

1.4. Parameters used to assess the quality element

The method uses a multi-parameter index, “Transitional Fish Classification Index” (TFCI), for the purpose of assessing the condition of the quality element. The TFCI is based on the parameters listed below:

(i) species composition;
(ii) presence of indicator species;
(iii) species relative abundance;
(iv) number of taxa that make up 90% of the abundance;
(v) number of estuarine resident taxa;
(vi) number of estuarine-dependent marine taxa;
(vii) functional guild composition;
(viii) number of benthic invertebrate feeding taxa;
(ix) number of piscivorous taxa; and
(x) feeding guild composition.

2. SAMPLING AND ANALYSIS

Within this method, “sampling” means the collection of representative fish fauna from a transitional water body so as to estimate the Ecological Quality Ratio.

2.1.1. Sampling sites

Sampling sites should be chosen to represent the range of fish fauna habitats, the range of salinity, and to provide a representative sample of the fish fauna.

2.1.2. Sampling method

A combination of sampling methods should be used to ensure a representative sample of the habitats and fish. Sampling methods may include, but are not restricted to, seine netting, fyke netting, fish traps, and various forms of trawling.

Sampling should be guided by the CEN Standards: EN 14757 Sampling of fish with multi-mesh gillnets & EN 14962 Guidance on the scope and selection of fish sampling methods.

2.1.3. Sample timing

Sampling should ideally be bi-annual (spring & autumn), however, if only annual surveys are conducted, then these should take place during autumn (September – November).

2.2. Analytical method

Samples should be analysed to species level according to a standard contemporary taxonomy.

3. PROCEDURE FOR DERIVING THE ECOLOGICAL QUALITY RATIO FROM THE PARAMETERS

3.1. Calculation of the observed value for each of the parameters

The observed values of the parameters to be derived from samples are summarised in Table 1 below.

Table 1: Observed values for the parameters used in the TFCI method

Parameter number	Parameter	Calculated value
1	Species composition	Number of taxa in Column 2 of Table 12a,b,c that are present in the sample.
2	Presence of indicator species	Number of indicator taxa identified as such using Column 5 of Table 12a,b,c and present in the sample
3	Species relative abundance	The relative abundance of each fish taxon expressed, as a percentage of the total number of individuals caught using Table 13a,b,c.
4	Number of taxa that make up 90 % of the	Number of taxa which cumulatively starting from

	abundance	the highest relative abundance taxa and subsequent next highest accounting for 90% of the total number of specimens in the sample using Table 13a,b,c.
5	Number of estuarine resident taxa	Number of estuarine resident (ER) taxa identified as such using Column 4 of Table12a,b,c and present in the sample
6	Number of estuarine-dependent marine taxa	Number of marine juvenile (MJ) taxa and marine seasonal (MS) taxa identified as such in Column 4 of Table 12a,b,c.
7	Functional guild composition	Number of different functional guilds referred to in Column 4 of Table 12a,b,c,
8	Number of benthic invertebrate feeding taxa	Number of benthic invertebrate feeding taxa (BI) identified using Column 6 of Table 12a.b,c
9	Number of piscivorous taxa	Number of piscivorous taxa (P) identified using Column 6 of Table 12a,b,c
10	Feeding Guild Composition	Number of different functional feeding guilds referred to in Column 6 of Table 12a,b,c

3.2. Calculation of the parametric indices for each parameter

Identification of transitional water ecotypes

To identify the transitional water ecotype, refer to Figure A to determine WFD ecoregion, Figure B and C for UK marine typology and Table 2 a,b,c column 3 to determine the ecotype. This allows ecotype reference condition and observed parameters to be determined from Table 12a,b,c and Table 13a,b,c.

Those water bodies identified as Rias are shown in Annex C.

Table 2a: Transitional water ecotypes – England, & Wales

WFD Ecoregion	UK Marine Typology	Transitional Water Ecotype (see table 12a,)
Col 1	Col 2	Col 3
Atlantic Ocean	TW1	A1
	TW2	A2
	TW3	A3
	TW4	A4
Atlantic Ocean	TW1	Ria *(E&W only, see Annex C)*
	TW2	
	TW3	
	TW4	
North Sea	TW2	B2
	TW3	B3
	TW4	B4

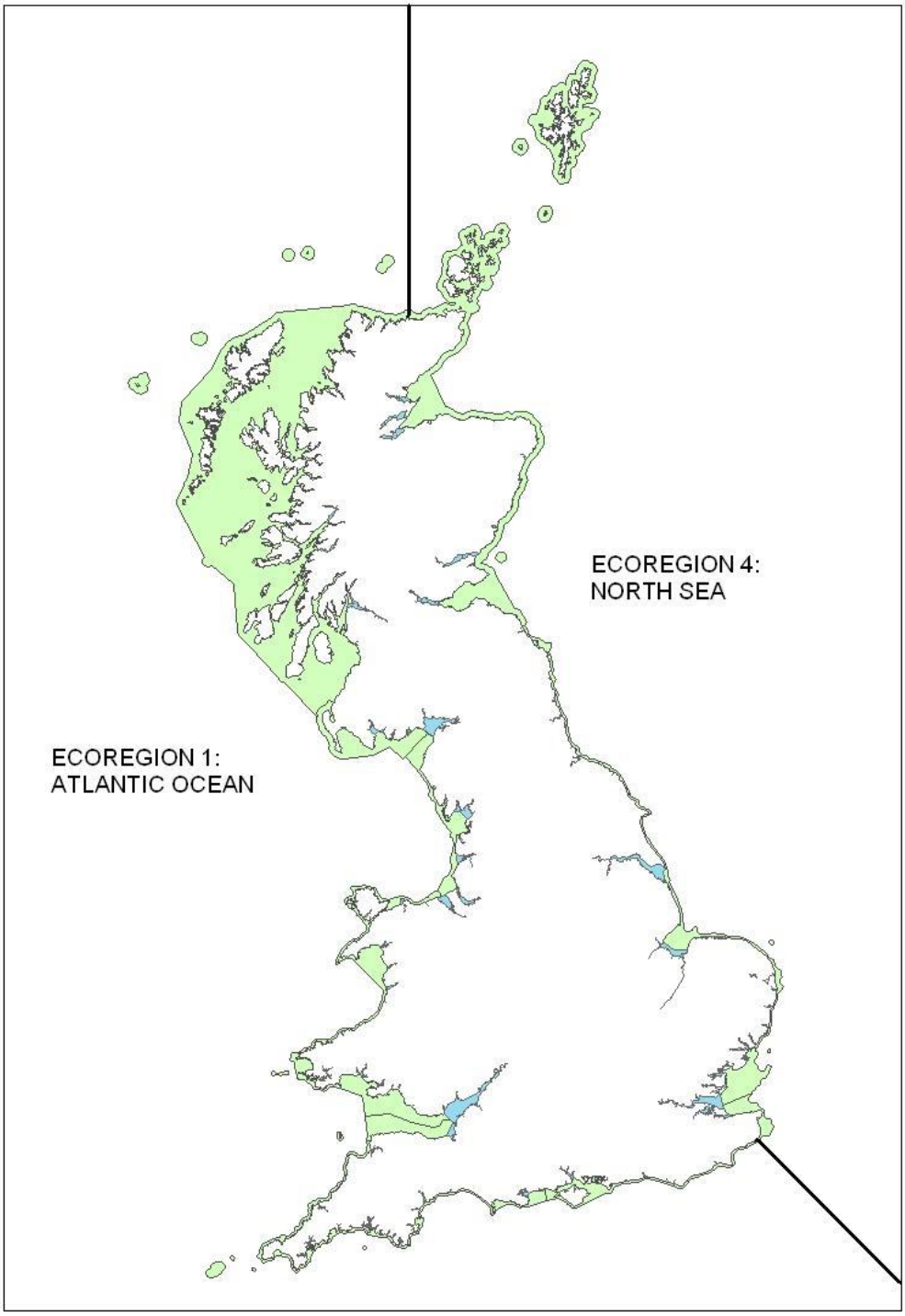
Table 2b: Transitional water ecotypes – Northern Ireland		
WFD Ecoregion	**UK Marine Typology**	**Transitional Water Ecotype (see table 12b)**
Col 1	Col 2	Col 3
Atlantic Ocean	TW2	NI2

Table 2c: Transitional water ecotypes – Scotland[1]		
WFD Ecoregion	**UK Marine Typology**	**Transitional Water Ecotype (see table 12c)**
Col 1	Col 2	Col 3
North Sea	TW2	SN2upp
North Sea	TW2	SN2mid
North Sea	TW2	SN2lwr

Annex B ,C and D contain a full list of UK transitional water bodies and their UK marine typology.

[1] Scottish transitional waters were originally split into water bodies which reflect different 'reaches'. This system presents the separate reference condition values. **S** for Scotland, **N** for North Sea, **2** for TW2, **upp** for upper, **mid** for middle, **lwr** for lower.

Figure A: Ecoregions for GB transitional and coastal waters



Legend for Figures B-D

UK & ROI Marine Typology Code for Transitional Waters which can be classified by the TFCI	Colour
TW1	Dark Brown
TW2	Brown

TW3	Yellow
TW4	Light Yellow

Figure B: Scotland

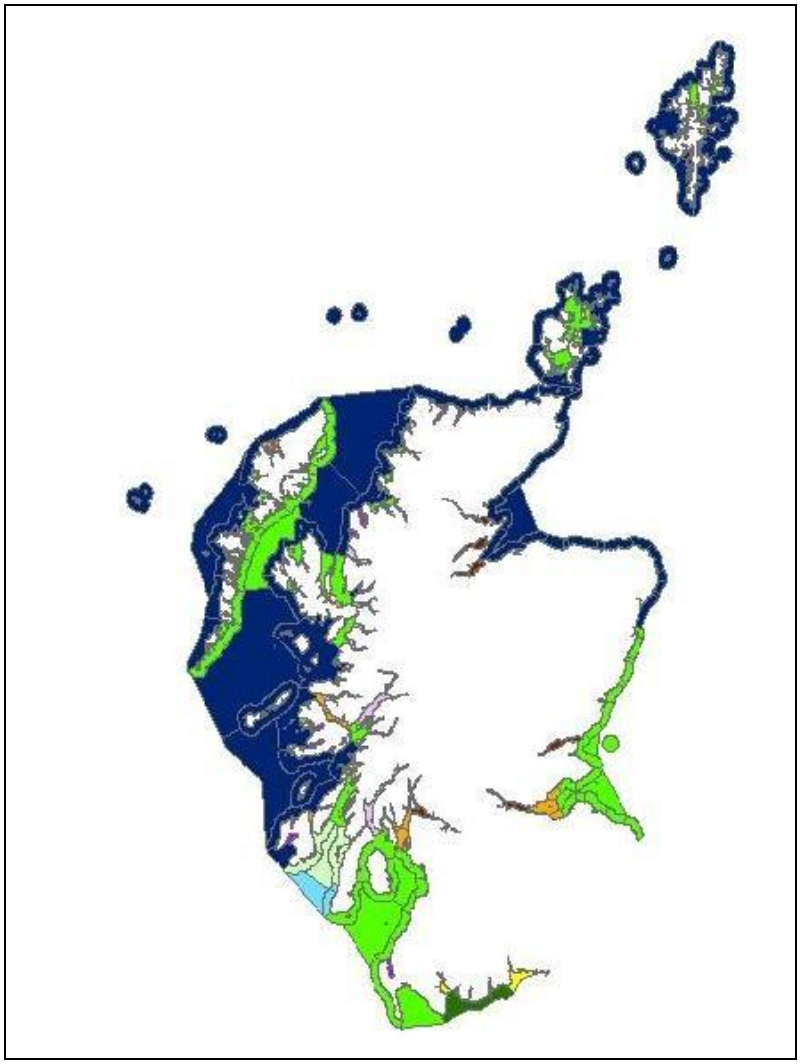


Figure C: England and Wales

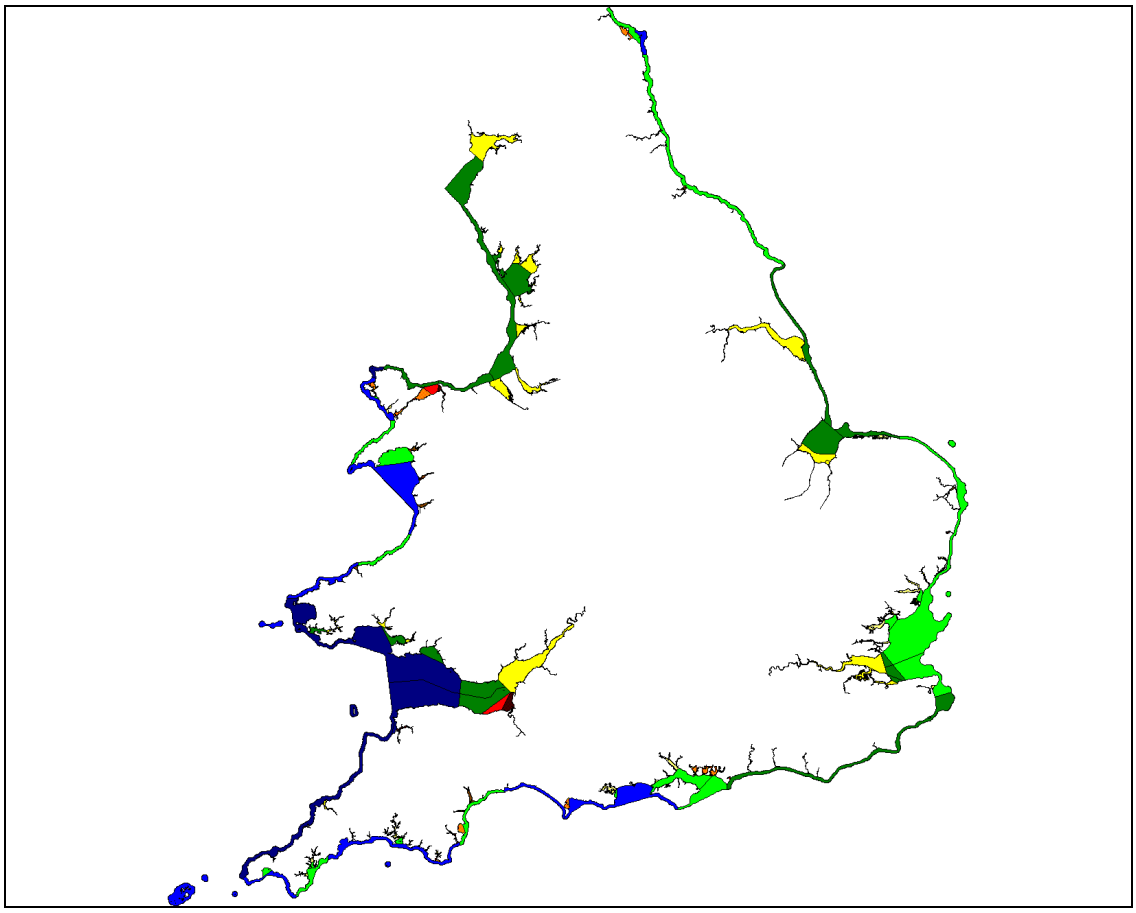
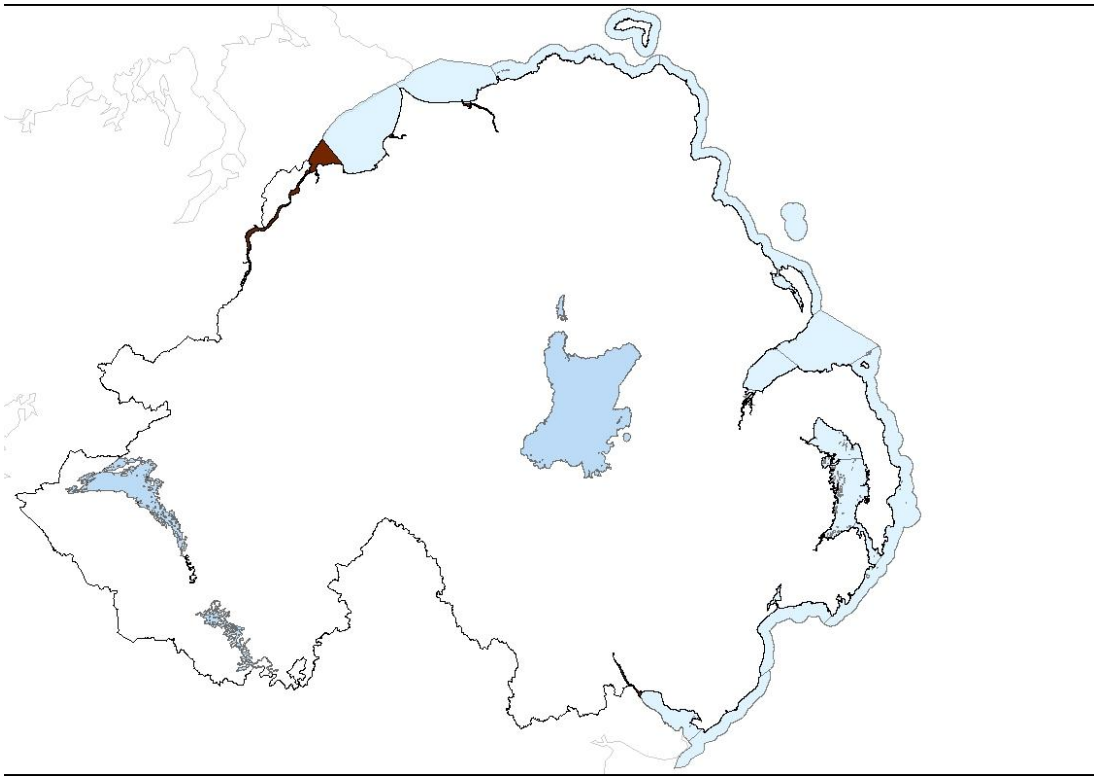


Figure D: Northern Ireland



Derivation of reference values for the TFCI parameters

The reference values used in calculating the parametric indices for each parameter were derived from historical records dated around 1800 or later (Yarrell, 1836; Jenkins, 1936) and/or survey samples. These reference values have been quality-assured with the Natural History Museum collection and UK Monitoring Agency [2] ecotype samples (1974 to 2008).

3.2.1. Calculation of the parametric index (PI_1) for parameter number 1, species composition,

To calculate the parametric index for parameter number 1, species composition, a Bray-Curtis similarity index (C_{z1}) should be estimated and expressed as a percentage using equation (1) or its algebraic equivalent:

$C_{z1} = 2C/A+R \times 100$

Equation (1)

where:
A is the number of taxa in Column 2 of Table 12a,b,c that are present in the sample;
R is the number of taxa in Column 2 of Table 12a,b,c for the relevant ecotype shown in column 3 of Table 12a,b,c as expected to be present under reference conditions in the applicable transitional water ecotype; and

[2] Monitoring data from FRS, CEFAS, EA, NIEA and SEPA

C is the number of the taxa common to the sample and reference list from table 12a,b,c present in the sample that are common to the reference condition R.

The Bray-Curtis similarity index (C_{z1}) should then be converted to the parametric index (PI_1) in accordance with Table 3.

Table 3: Parametric index for parameter number 1, species composition

Column 1	Column 2
Bray Curtis similarity index (C_{z1}), %	**Parametric index, PI_1**
0 to < 20	1
20 to < 40	2
40 to < 60	3
60 to < 80	4
80 to 100	5

3.2.2. Calculation of the parametric index (PI_2) for parameter number 2, presence of indicator taxa

To calculate the parametric index for parameter number 2, presence of indicator species, ratio (*T* ÷ *R*) should be determined for the applicable transitional water ecotype, where:

"T" is the number of indicator taxa in the sample found from column 3 and 5 of table 12a,b,c; and

"R" is the number of indicator taxa identified using Columns 3 and 5 of Table 12a,b,c as expected to be present under reference conditions.

The parametric index (PI_2) should then be calculated from column 2 of Table 4 according to the calculated value of "*T* ÷ *R*"

Table 4: Parametric index for parameter number 2, presence of indicator species

Column 1	Column 2
(*T* ÷ *R*)	**Parametric index, PI_2**
0 to < 0.2	1
0.2 to < 0.4	2
0.4 to < 0.6	3
0.6 to < 0.8	4
0.8 to 1	5

3.2.3. Calculation of the parametric index (PI_3) for parameter number 3, species relative abundance

To calculate the parametric index for parameter number 3, species relative abundance, a Bray-Curtis similarity index (C_{z3}) should be estimated and expressed as a percentage using equation (2) or its algebraic equivalent:

$C_{z3} = 2\ \Sigma Cmin/A+R \times 100$

Equation (2)

where:

A is the sum of the relative abundance of fish in each of the taxa in Column 2 of Table 13a,b,c and present in the sample expressed as a percentage of the total number of fish present in the sample;

R is the sum of the relative abundance of fish taxa identified as be present under reference conditions in Column 2, 3, 4, 5, 6, 7, 8 or 9, of Table 13a,b,c as applicable to the transitional water ecotype into which the transitional water or part thereof has been assigned ; and

ΣCmin is the sum of the minimum relative abundance values of taxa common to the sample and to the appropriate reference condition in Column 2, 3, 4, 5, 6, 7, 8 or 9, of Table 13a,b,c

The Bray-Curtis similarity index (Cz3) should then be converted to the parametric index (PI_3) in accordance with Table 5.

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Table 5: Parametric index for parameter number 3, species relative abundance

Column 1	Column 2
Bray Curtis similarity index (C_{z3}), %	**Parametric index, PI_3**
0 to < 20	1
20 to < 40	2
40 to < 60	3
60 to < 80	4
80 to 100	5

3.2.4. Calculation of the parametric index (PI_4) for parameter number 4, number of taxa that make up 90 % of the abundance

The parametric index (PI_4) for parameter number 4, number of taxa that make up 90 % of the abundance, should be calculated according to equation (3):

If $N_4 \geq S_4$, $PI_4 = 5$;
If $N_4 < S_4$, $PI_4 = [1 + 5 \times (N_4 \div S_4)]$, truncated to its integer value

Equation (3)

Where:

"N_4" is the observed value for the parameter; and

"S_4" is the value for the parameter reference condition value in Column 2 of Table 6 below corresponding to the transitional water ecotype in Column 1 of that Table applicable to the transitional water being assessed.

Table 6a: Reference condition values (S_4) for parameter 4 in different transitional water ecotypes – England, & Wales

Transitional water ecotype	Parameter reference condition value
Column 1	Column 2
A1	≥5.96
A2	≥5.34
A3	≥4.55
A4	≥5.37
B2	≥4.77
B3	≥7.39
B4	≥7.85
Ria	≥4.11

Table 6b: Reference condition values (S_4) for parameter 4 in different transitional water ecotypes – Northern Ireland

Transitional water ecotype	Parameter reference condition value
Column 1	Column 2
NI2	≥7.48

Table 6c: Reference condition values (S_4) for parameter 4 in different transitional water ecotypes – Scotland

Transitional water ecotype	Parameter reference condition value
Column 1	Column 2
SN2upp	≥ 6.26
SN2mid	≥ 6.79
SN2lwr	≥ 8.60

3.2.5. Calculation of the parametric indices (PI_5, PI_6, PI_8 and PI_9) for parameter numbers 5 (number of estuarine resident taxa), 6 (number of estuarine-dependent marine taxa), 8 (number of benthic invertebrate feeding taxa) and 9 (number of piscivorous taxa)

The parametric indices (PI_5, PI_6, PI_8 and PI_9) for parameter numbers 5 (number of estuarine resident taxa ER in table 12a,b,c column 4), 6 (number of estuarine-dependent marine taxa, MS or MJ in table 12 column 4), 8 (number of benthic invertebrate feeding taxa B in table 12 column 6) and 9 (number of piscivorous taxa P in table 12 column 6), respectively, should be calculated according to equation 4 below:

If $N_P \geq S_P$, $PI_P = 5$;

If $N_P < S_P$, $PI_P = [1 + 5 \times (N_P \div S_P)]$, truncated to its integer value

Equation (4)

Where:

"N_P" is the observed value for parameter number 5, 6, 8 or 9, as applicable;

"S_P" is the number of taxa listed in Column 2 of Table 12a,b,c as present under reference conditions in the applicable transitional water ecotype; and identified using Column 4 of Table 12a,b,c as being; in the case of parameter 5, estuarine resident taxa (ER) or, in the case of parameter 6, estuarine-dependent marine taxa (MS and MJ); or identified using Column 6 of Table 12a,b,c in the case of parameter 8, benthic invertebrate feeding taxa (B) or, in the case of parameter 9, piscivorous taxa (P); and

PI_P is the parametric index for parameter number 5, 6, 8 or 9 as applicable.

Table 7a: Reference condition values for parameter 5 in different transitional water ecotypes – England & Wales

Transitional water ecotype	Parameter reference condition value
Column 1	Column 2
A1	≥8.01
A2	≥7.21
A3	≥12.01
A4	≥11.21
B2	≥12.01
B3	≥12.81
B4	≥10.41
Ria	≥11.21

Table 7b: Reference condition values for parameter 5 in different transitional water ecotypes – Northern Ireland

Transitional water ecotype	Parameter reference condition value
Column 1	Column 2
NI2	≥7.40

Table 7c: Reference condition values for parameter 5 in different transitional water ecotypes – Scotland	
Transitional water ecotype	**Parameter reference condition value**
Column 1	Column 2
SN2upp	≥ 5.61
SN2mid	≥ 5.61
SN2lwr	≥ 8.01

Table 8a: Reference condition values for parameter 6 in different transitional water ecotypes – England & Wales	
Transitional water ecotype	**Parameter reference condition value**
Column 1	Column 2
A1	≥12.01
A2	≥11.21
A3	≥14.41
A4	≥11.21
B2	≥10.41
B3	≥16.01
B4	≥13.61
Ria	≥12.81

Table 8b: Reference condition values for parameter 6 in different transitional water ecotypes – Northern Ireland	
Transitional water ecotype	**Parameter reference condition value**
Column 1	Column 2
NI2	≥9.22

Table 8c: Reference condition values for parameter 6 in different transitional water ecotypes – Scotland	
Transitional water ecotype	**Parameter reference condition value**
Column 1	Column 2
SN2upp	≥ 4.01
SN2mid	≥ 5.61
SN2lwr	≥ 6.41

Table 9a: Reference condition values for parameter 8 in different transitional water ecotypes – England & Wales	
Transitional water ecotype	**Parameter reference condition value**
Column 1	Column 2
A1	≥16.01
A2	≥16.01
A3	≥28.01
A4	≥20.01
B2	≥16.81
B3	≥31.21
B4	≥26.41
Ria	≥26.41

Table 9b: Reference condition values for parameter 8 in different transitional water ecotypes – Northern Ireland	
Transitional water ecotype	**Parameter reference condition value**
Column 1	Column 2
NI2	≥12.24

Table 9c: Reference condition values for parameter 8 in different transitional water ecotypes – Scotland	
Transitional water ecotype	**Parameter reference condition value**
Column 1	Column 2
SN2upp	≥ 4.01
SN2mid	≥ 4.81
SN2lwr	≥ 7.21

Table 10a: Reference condition values for parameter 9 in different transitional water ecotypes – England & Wales	
Transitional water ecotype	**Parameter reference condition value**

Column 1	Column 2
A1	≥9.61
A2	≥8.01
A3	≥13.61
A4	≥7.21
B2	≥9.61
B3	≥10.41
B4	≥5.61
Ria	≥11.21

Table 10b: Reference condition values for parameter 9 in different transitional water ecotypes – Northern Ireland

Transitional water ecotype	Parameter reference condition value
Column 1	Column 2
NI2	≥6.11

Table 10c: Reference condition values for parameter 9 in different transitional water ecotypes – Scotland

Transitional water ecotype	Parameter reference condition value
Column 1	Column 2
SN2upp	≥ 6.41
SN2mid	≥ 6.41
SN2lwr	≥ 4.01

3.2.6. Calculation of the parametric index (PI_7) for parameter number 7, functional guild composition and parametric index (P_{10}) for parameter number 10, feeding guild composition

The parametric index (PI_7) for parameter number 7, functional guild composition should be calculated according to equation (5):

$PI_7 = T \div R$

$PI_{10} = T \div R$

Equations (5 and 6)

To calculate the parametric index for parameter number 7, functional guild composition and parameter number 10, feeding guild composition, ratio (T ÷ R) should be determined, where:

"T" is the observed value for the parameter; and
"R" is the number of guilds identified using Columns 4 and 6 of Table 12 as expected to be present under reference conditions in the applicable transitional water ecotype

The parametric index (PI_7 and PI_{10}) should then be calculated from column 2 of Table 11 according to the calculated value of "$T \div R$"

Table 11: Parametric index for parameter number 7 & 10 , functional guild composition

Column 1	Column 2
($T \div R$)	**Parametric index, PI_7 or PI_{10}**
0 to < 0.2	1
0.2 to < 0.4	2
0.4 to < 0.6	3
0.6 to < 0.8	4
0.8 to 1	5

3.3. Calculation of the Transitional Fish Quality Index, TFCI

The Transitional Fish Quality Index should be calculated according to equation (7):

$$TFCI = (PI_1 + PI_2 + PI_3 + PI_4 + PI_5 + PI_6 + PI_7 + PI_8 + PI_9 + PI_{10} - 10) \div 40 \qquad \text{Equation (7)}$$

Annex A: Reference condition data used in calculating the parametric indices

Table 12a: Reference condition data according to ecotype – England & Wales

Column 1	Column 2	Column 3								Column 4	Column 5	Column 6
Common Name	**Scientific Name**	**Transitional water ecotype** (***** = *species listed in Column 1 and present in the type at reference conditions*)								**Functional Guilds:** **ER =** Estuarine resident taxa **FW =** Freshwater taxa **CA** Diadromous taxa **MS** Marine seasonal taxa **MJ** Marine juvenile taxa **MA** Marine adventitious taxa	**Indicator taxa (IND)**	**Feeding Guilds:** **B** Benthic invertebrate feeding taxa **Z** Zooplankton feeding taxa **P** Piscivorous feeding taxa **D** Detritus feeding taxa **O** Omnivorous feeding taxa
		A1	**A2**	**A3**	**A4**	**B2**	**B3**	**B4**	**Ria**			
Silver bream	*Abramis bjoerkna*	*					*			FW	-	B
Common bream/Bream	*Abramis brama*	*		*			*		*	FW	-	B
Sturgeon	*Acipenser sturio*		*	*	*	*	*		*	CA	IND	B
Hooknose/Pogge	*Agonus cataphractus*	*	*	*		*	*	*	*	ER	-	B
Bleak	*Alburnus alburnus*	*					*			FW	-	Z
Allis shad	*Alosa alosa*	*		*	*	*	*		*	CA	IND	Z
Twaite shad	*Alosa fallax*	*	*	*	*	*	*	*	*	CA	IND	Z
Lesser sand-eel/ Raitt's Sand-eel	*Ammodytes marinus*					*	*		*	MA	-	Z
Sandeel, Small sandeel	*Ammodytes tobianus*	*	*	*	*	*	*	*	*	ER	-	Z
Sand eel sp.	*Ammodytidae*									ER	-	Z
	Anarhichas lupus						*		*	MA		P
European eel	*Anguilla anguilla*	*	*	*	*	*	*	*	*	CA	IND	P
Transparent goby	*Aphia minuta*	*	*	*	*		*	*	*	ER	-	Z
Small-headed clingfish	*Apletodon microcephalus*								*	MA	-	B
Common argentine	*Argentina sphyraena*						*			MA	-	B
Meagre	*Argyrosomus regius*			*		*			*	MA	-	P
Scaldfish	*Arnoglossus laterna*		*	*			*	*	*	MA	-	B
(E.atlantic) Red gurnard	*Aspitrigla cuculus*		*			*	*	*	*	MA	-	B
Big-eyed Sand-smelt	*Atherina boyeri*						*			ER	-	P
Sand smelt	*Atherina presbyter*	*	*	*	*	*	*	*	*	MJ	-	Z
Stone loach	*Barbatula barbatula*			*						FW	-	B

Barbel	*Barbus barbus*			*						FW	-	B
Garfish	*Belone belone*	*	*	*	*		*	*	*	MS	-	P
Butterfly blennie	*Blennius ocellaris*						*			MA	-	B
Atlantic pomfret	*Brama brama*									MA		B
Solenette	*Buglossidium luteum*	*		*	*		*		*	MA	-	B
Dragonet	*Callionymus lyra*	*	*	*	*	*	*	*	*	MA	-	B
Spotted dragonet	*Callionymus maculatus*						*		*			
Reticulated dragonet	*Callionymus reticulatus*		*		*		*	*		MA	-	B
Goldfish varieties	*Carassius auratus*	*								FW	-	D
Rock cook	*Centrolabrus exoletus*				*				*			
Red bandfish	*Cepola rubescens*	*			*	*			*			
Tub gurnard	*Chelidonichthys lucernus*									MJ	-	B
Thicklip grey mullet	*Chelon labrosus*	*	*	*	*	*	*	*	*	MS	-	D
Fivebeard rockling	*Ciliata mustela*	*	*	*	*	*	*	*	*	MS	-	B
Northern rockling	*Ciliata septentrionalis*			*		*	*		*			
herring	*Clupea harengus*	*	*	*	*	*	*	*	*	MJ	-	Z
Herring like sp.	*Clupeidae*									MS	-	Z
European conger/Conger eel	*Conger conger*			*			*		*	MA	-	P
Pollan	*Coregonus autumnalis*									CA	-	B
Common whitefish/Powan	*Coregonus lavaretus*				*		*	*		ER	-	Z
Houting	*Coregonus oxyrinchus*									ER	-	Z
Montagu's Blenny	*Coryphoblennius galerita*								*			
Bullhead	*Cottus gobio*		*							FW	-	B
Corkwing wrasse	*Crenilabrus melops*	*	*	*	*	*	*	*	*	MA	-	B
Goldsinny-wrasse	*Ctenolabrus rupestris*		*		*	*			*	MA	-	B
Lumpsucker	*Cyclopterus lumpus*	*	*	*	*	*	*	*	*	MS	-	B
Common carp varieties	*Cyprinus carpio*			*						FW	-	B
Common stingray	*Dasyatis pastinaca*				*	*	*	*	*			
European seabass	*Dicentrarchus labrax*	*	*	*	*	*	*	*	*	MJ	-	P
Two-spotted clingfish	*Diplecogaster bimaculata*				*				*	ER	-	B
Lesser weever	*Echiichthys vipera*		*	*	*	*	*	*	*			
Four-bearded Rockling	*Enchelyopus cimbrius*				*		*		*	MA	-	B
European anchovy	*Engraulis encrasicolus*	*		*	*		*	*		MS	-	Z
Snake pipefish	*Entelurus aequoreus*				*	*	*	*	*	MA	-	Z
(northern) Pike	*Esox lucius*	*		*						FW	-	P
Grey gurnard	*Eutrigla gurnardus*	*	*	*	*	*	*	*	*	MS	-	B
Silvery cod	*Gadiculus argenteus argenteus*									MA	-	B
Atlantic cod	*Gadus morhua*	*	*	*	*	*	*	*	*	MJ	-	P
Shore rockling	*Gaidropsarus mediterraneus*			*	*				*	MA	-	B
Three-bearded rockling	*Gaidropsarus vulgaris*			*	*	*	*	*	*	MA	-	B

Three-spined stickleback	*Gasterosteus aculeatus*	*	*	*	*	*	*	*	*	CA	-	Z
Goby sp.	*Gobiidae*									ER	-	B
Gudgeon	*Gobio gobio*	*		*		*	*			FW	-	D
Giant goby	*Gobius cobitis*		*		*		*	*	*	MS	-	B
Black goby	*Gobius niger*				*	*	*	*	*	ER	-	B
Rock goby	*Gobius paganellus*	*	*	*	*		*	*	*	ER	-	B
Two-spotted goby	*Gobiusculus flavescens*	*			*	*		*	*	MA	-	B
Long-snouted seahorse	*Hippocampus guttulatus*									ER	-	Z
Short-snouted Seahorse	*Hippocampus hippocampus*				*		*		*	MA	-	Z
Long snouted Sea horse	*Hippocampus ramulosus*				*		*	*	*	ER	-	Z
Long rough dab	*Hippoglossoides platessoides*							*		MA	-	B
Atlantic halibut	*Hippoglossus hippoglossus*								*			
Greater sand-eel	*Hyperoplus immaculatus*			*		*				ER	-	B
Great sandeel	*Hyperoplus lanceolatus*	*			*	*	*		*	ER	-	B
Skipjack tuna	*Katsuwonus pelamis*									MS		P
Ballan wrasse	*Labrus bergylta*	*	*		*		*	*	*	MA	-	B
Cuckoo wrasse	*Labrus mixtus*				*				*	MA	-	B
European river lamprey	*Lampetra fluviatilis*	*	*	*	*	*	*	*	*	CA	IND	P
Brook lamprey	*Lampetra planeri*									FW	-	P
Shore Clingfish	*Lepadogaster lepadogaster*			*	*				*			
Megrim	*Lepidorhombus whiffiagonis*	*		*					*	MA	-	P
Chub	*Leuciscus cephalus*	*		*		*				FW	-	P
Common dace	*Leuciscus leuciscus*	*	*	*	*	*	*			FW	-	Z
Dab	*Limanda limanda*	*	*	*	*	*	*	*	*	MJ	-	B
Sea Snail/Striped seasnail	*Liparis liparis*	*		*		*	*	*	*	ER	-	B
Montagu's Sea Snail	*Liparis montagui*	*				*	*	*	*	MA	-	B
Shanny	*Lipophrys pholis*	*	*		*			*	*	MA	-	B
Golden grey mullet	*Liza aurata*	*	*	*	*	*	*	*	*	MS	-	D
Thin lipped grey mullet	*Liza ramada*	*	*	*	*	*	*	*	*	CA	-	D
Angler	*Lophius piscatorius*				*	*	*	*	*			
Snake blenny	*Lumpenus lumpretaeformis*							*		MA	-	B
Pearlsides	*Maurolicus muelleri*					*						
Haddock	*Melanogrammus aeglefinus*					*	*			MA		B
Whiting	*Merlangius merlangus*	*	*	*	*	*	*	*	*	MJ	-	P
Hake	*Merluccius merluccius*			*					*			
Thickback Sole	*Microchirus variegatus*				*				*			
Blue Whiting	*Micromesistius poutassou*			*				*				
Lemon Sole	*Microstomus kitt*			*	*	*	*	*	*	MA	-	B
Ling	*Molva molva*						*		*	MA	-	P
(Striped) red mullet	*Mullus surmuletus*	*		*	*		*	*	*	MA	-	B
Starry smooth hound	*Mustelus asterias*				*	*	*	*	*	MA	-	B

Smooth hound	*Mustelus mustelus*				*					MA	-	B
Bullrout / Short-spined sea scorpion/Shorthorn sculpin	*Myoxocephalus scorpius*	*		*	*	*	*	*	*	ER	-	P
Hagfish	*Myxine glutinosa*					*				MA	-	P
Worm pipefish	*Nerophis lumbriciformis*	*	*		*	*	*		*	ER	-	Z
Straightnose pipefish	*Nerophis ophidion*			*	*		*			ER	-	Z
Rainbow trout	*Oncorhynchus mykiss*								*	FW	-	P
European smelt	*Osmerus eperlanus*	*	*	*	*	*	*	*	*	CA	IND	Z
Blackspot seabream	*Pagellus bogaraveo*									MJ	-	B
Tompot blenny	*Parablennius gattorugine*	*			*				*	MA	-	B
Perch / European perch	*Perca fluviatilis*	*		*			*			FW	-	P
Sea lamprey	*Petromyzon marinus*			*	*		*		*	CA	IND	P
Lamprey sp.	*Petromyzontidae*									CA	-	P
Butterfish / Rock gunnel	*Pholis gunnellus*	*	*	*	*	*	*	*	*	ER	-	B
Minnow / Eurasian minnow	*Phoxinus phoxinus*	*	*	*		*			*	FW	-	Z
Norwegian topknot	*Phrynorhombus norvegicus*								*	MA	-	B
Flounder	*Platichthys flesus*	*	*	*	*	*	*	*	*	ER	-	B
Plaice / European plaice	*Pleuronectes platessa*	*	*	*	*	*	*	*	*	MJ	-	B
Right sided flatfish sp.	*Pleuronectidae*									-	-	B
Pollack	*Pollachius pollachius*	*	*	*	*	*	*		*	MJ	-	P
Saithe/Coalfish	*Pollachius virens*		*	*	*	*	*		*	MA	-	P
Lozano's goby	*Pomatoschistus lozanoi*			*	*					MA	-	B
Common goby	*Pomatoschistus microps*	*	*	*	*	*	*	*	*	ER	-	B
Sand goby	*Pomatoschistus minutus*	*	*	*	*	*	*	*	*	ER	-	B
Painted goby	*Pomatoschistus pictus*	*	*	*	*		*	*	*	MA	-	B
Goby sp.	*Pomatoschistus sp.*									MA		
Turbot	*Psetta maxima*			*	*		*			MS	-	P
Ninespine stickleback	*Pungitius pungitius*	*				*	*	*		CA	-	Z
Common skate	*Raja batis*							*				
Blonde ray	*Raja brachyura*								*			
Thornback ray	*Raja clavata*	*		*	*	*	*	*	*	MA	-	B
Painted ray / small eye ray	*Raja microocellata*								*	MA	-	P
Spotted ray	*Raja montagui*	*		*	*	*		*	*			
Tadpole fish	*Raniceps raninus*			*	*	*	*	*	*	ER	-	O
Roach	*Rutilus rutilus*	*		*	*	*	*			FW	-	Z
Roach x common bream hybrid	*Rutilus rutilus x Abramis brama*	*					*			FW	-	Z
Atlantic salmon	*Salmo salar*	*	*	*	*	*	*	*	*	CA	IND	P
Brown trout	*Salmo trutta*	*	*	*	*	*	*	*	*	FW	-	P
Sea trout	*Salmo trutta trutta*									CA	IND	P
Char	*Salvelinus alpinus alpinus*									CA	-	Z
European pilchard	*Sardina pilchardus*						*		*	MS	-	Z

Rudd	*Scardinius erythrophthalmus*	*					*		*	FW	-	B
Rudd x common bream hybrid	*Scardinius erythrophthalmus x Abramis brama*			*						FW	-	Z
Atlantic Mackerel	*Scomber scombrus*	*		*		*	*		*	MA	-	P
King gar	*Scomberesox saurus*						*					
Brill	*Scophthalmus rhombus*	*	*	*		*	*	*	*	MA	-	P
Turbot	*Scophthalmus maximus*						*		*			
Small-scaled Scorpionfish	*Scorpaena porcus*	*					*		*			
Brill	*Scyliorhinus canicula*	*	*	*			*	*	*	MA	-	P
Huss/ Smoothhound/ Nursehound/	*Scyliorhinus stellaris*	*	*	*			*	*	*	MA	-	B
Sand Sole	*Solea lascaris*		*	*		*			*	MA	-	B
Common sole / Dover sole	*Solea solea*	*	*	*		*	*	*	*	MJ	-	B
Gilthead bream	*Sparus aurata*					*			*	MA	-	P
Sea stickleback/Fifteen-spined stickleback	*Spinachia spinachia*	*	*	*		*			*	ER	-	Z
Black sea bream	*Spondyliosoma cantharus*	*				*	*	*	*	MJ	-	B
European sprat	*Sprattus sprattus*	*	*	*		*	*	*	*	MS	-	Z
Angelshark	*Squatina squatina*					*			*			
Corkwing wrasse	*Symphodus melops*									MA	-	B
Pipe fish & Sea horse sp.	*Syngnathidae*									ER	-	Z
Greater pipefish	*Syngnathus acus*	*	*	*		*	*	*	*	ER	-	Z
Nilsson's pipefish	*Syngnathus rostellatus*	*	*	*		*	*	*	*	ER	-	Z
Broad-nosed pipefish	*Syngnathus typhle*	*					*	*	*	ER	-	Z
Longspined bullhead	*Taurulus bubalis*	*	*	*		*	*	*	*	MA	-	B
Grayling	*Thymallus thymallus*			*						FW	-	B
Tench varieties	*Tinca tinca*	*					*			FW	-	B
Greater weever	*Trachinus draco*		*	*					*			
Atlantic horse mackerel/Scad	*Trachurus trachurus*			*		*	*	*	*	MA	-	P
Tub gurnard	*Trigla lucerna*	*		*			*	*	*	MJ	-	B
Gurnard sp.	*Triglidae*									-	-	B
Streaked gurnard	*Trigloporus lastoviza*			*			*		*			
Norway pout	*Trisopterus esmarkii*					*				MA	-	B
Pouting / Bib	*Trisopterus luscus*			*		*	*	*	*	MJ	-	B
Poor cod	*Trisopterus minutus*		*	*		*	*	*	*	MA	-	B
Topknot	*Zeugopterus punctatus*			*		*	*		*	MA	-	B
Dory	*Zeus faber*					*	*	*	*	MA	-	P
Viviparous blenny	*Zoarces viviparus*					*	*	*		ER	-	B
Column 4 - After Elliott & Dewailly (1995) & after appendix of Elliott & Hemingway (2002)												
Column 6 Feeding guilds were developed by												

Whitfield (1998) (Note: not all UK species were assigned guilds so expert judgement has been used)												

Table 12b: Reference condition data according to ecotype – Northern Ireland

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6
Common Name	**Scientific Name**	**Transitional water ecotype** (***** = *species listed in Column 1 and present in the type at reference conditions*)	**Functional Guilds:** **ER =** Estuarine resident taxa **FW =** Freshwater taxa **CA** Diadromous taxa **MS** Marine seasonal taxa **MJ** Marine juvenile taxa **MA** Marine adventitious taxa	**Indicator taxa (IND)**	**Feeding Guilds:** **B** Benthic invertebrate feeding taxa **Z** Zooplankton feeding taxa **P** Piscivorous feeding taxa **D** Detritus feeding taxa **O** Omnivorous feeding taxa
		NI 2			
Silver bream	*Abramis bjoerkna*		FW	-	B
Common bream/Bream	*Abramis brama*		FW	-	B
Sturgeon	*Acipenser sturio*		CA	-	B
Hooknose/Pogge	*Agonus cataphractus*	*	ER	-	B
Bleak	*Alburnus alburnus*		FW	-	Z
Allis shad	*Alosa alosa*		CA	IND	Z
Twaite shad	*Alosa fallax*		CA	IND	Z
Lesser sand-eel/ Raitt's Sand-eel	*Ammodytes marinus*		MA	-	Z
Sandeel, Small sandeel	*Ammodytes tobianus*	*	ER	-	Z
Sand eel sp.	*Ammodytidae*		ER	-	Z
	Anarhichas lupus		MA		P
European eel	*Anguilla anguilla*	*	CA	IND	P
Transparent goby	*Aphia minuta*		ER	-	Z
Small-headed clingfish	*Apletodon microcephalus*		MA	-	B
Common argentine	*Argentina sphyraena*		MA	-	B
Meagre	*Argyrosomus regius*		MA	-	P
Scaldfish	*Arnoglossus laterna*		MA	-	B
(E.atlantic) Red gurnard	*Aspitrigla cuculus*		MA	-	B
Big-eyed Sand-smelt	*Atherina boyeri*		ER	-	P

Sand smelt	*Atherina presbyter*	*	MJ	-	Z
Stone loach	*Barbatula barbatula*		FW	-	B
Barbel	*Barbus barbus*		FW	-	B
Garfish	*Belone belone*		MS	-	P
Butterfly blennie	*Blennius ocellaris*		MA	-	B
Silver Bream	*Blicca bjoerkna*		FW	-	B
Atlantic pomfret	*Brama brama*		MA		B
Solenette	*Buglossidium luteum*		MA	-	B
Dragonet	*Callionymus lyra*		MA	-	B
Spotted dragonet	*Callionymus maculatus*				
Reticulated dragonet	*Callionymus reticulatus*		MA	-	B
Goldfish varieties	*Carassius auratus*		FW	-	D
Rock cook	*Centrolabrus exoletus*				
Red bandfish	*Cepola rubescens*				
Tub gurnard	*Chelidonichthys lucernus*		MJ	-	B
Thicklip grey mullet	*Chelon labrosus*	*	MS	-	D
Fivebeard rockling	*Ciliata mustela*	*	MS	-	B
Northern rockling	*Ciliata septentrionalis*				
herring	*Clupea harengus*	*	MJ	-	Z
Herring like sp.	*Clupeidae*		MS	-	Z
European conger/Conger eel	*Conger conger*		MA	-	P
Pollan	*Coregonus autumnalis*		CA	-	B
Common whitefish/Powan	*Coregonus lavaretus*		ER	-	Z
Houting	*Coregonus oxyrinchus*		ER	-	Z
Montagu's Blenny	*Coryphoblennius galerita*				
Bullhead	*Cottus gobio*		FW	-	B
Corkwing wrasse	*Crenilabrus melops*		MA	-	B
Goldsinny-wrasse	*Ctenolabrus rupestris*		MA	-	B
Lumpsucker	*Cyclopterus lumpus*		MS	-	B
Common carp varieties	*Cyprinus carpio*		FW	-	B
Common stingray	*Dasyatis pastinaca*				
European seabass	*Dicentrarchus labrax*		MJ	-	P
Two-spotted clingfish	*Diplecogaster bimaculata*		ER	-	B
Lesser weever	*Echiichthys vipera*				
Four-bearded Rockling	*Enchelyopus cimbrius*		MA	-	B
European anchovy	*Engraulis encrasicolus*		MS	-	Z
Snake pipefish	*Entelurus aequoreus*		MA	-	Z
(northern) Pike	*Esox lucius*		FW	-	P
Grey gurnard	*Eutrigla gurnardus*		MS	-	B
Silvery cod	*Gadiculus argenteus argenteus*		MA	-	B
Atlantic cod	*Gadus morhua*	*	MJ	-	P

Shore rockling	*Gaidropsarus mediterraneus*		MA	-	B
Three-bearded rockling	*Gaidropsarus vulgaris*		MA	-	B
Three-spined stickleback	*Gasterosteus aculeatus*	*	CA	-	Z
Goby sp.	*Gobiidae*		ER	-	B
Gudgeon	*Gobio gobio*		FW	-	D
Giant goby	*Gobius cobitis*		MS	-	B
Black goby	*Gobius niger*		ER	-	B
Rock goby	*Gobius paganellus*		ER	-	B
Two-spotted goby	*Gobiusculus flavescens*		MA	-	B
Long-snouted seahorse	*Hippocampus guttulatus*		ER	-	Z
Short-snouted Seahorse	*Hippocampus hippocampus*		MA	-	Z
Long snouted Sea horse	*Hippocampus ramulosus*		ER	-	Z
Long rough dab	*Hippoglossoides platessoides*		MA	-	B
Atlantic halibut	*Hippoglossus hippoglossus*				
Greater sand-eel	*Hyperoplus immaculatus*		ER	-	B
Great sandeel	*Hyperoplus lanceolatus*		ER	-	B
Skipjack tuna	*Katsuwonus pelamis*		MS		P
Ballan wrasse	*Labrus bergylta*		MA	-	B
Cuckoo wrasse	*Labrus mixtus*		MA	-	B
European river lamprey	*Lampetra fluviatilis*		CA	IND	P
Brook lamprey	*Lampetra planeri*		FW	-	P
Shore Clingfish	*Lepadogaster lepadogaster*				
Megrim	*Lepidorhombus whiffiagonis*		MA	-	P
Chub	*Leuciscus cephalus*		FW	-	P
Common dace	*Leuciscus leuciscus*		FW	-	Z
Dab	*Limanda limanda*		MJ	-	B
Sea Snail/Striped seasnail	*Liparis liparis*		ER	-	B
Montagu's Sea Snail	*Liparis montagui*		MA	-	B
Shanny	*Lipophrys pholis*		MA	-	B
Golden grey mullet	*Liza aurata*		MS	-	D
Thin lipped grey mullet	*Liza ramada*		CA	-	D
Angler	*Lophius piscatorius*				
Snake blenny	*Lumpenus lumpretaeformis*		MA	-	B
Pearlsides	*Maurolicus muelleri*				
Haddock	*Melanogrammus aeglefinus*		MA		B
Whiting	*Merlangius merlangus*	*	MJ	-	P
Hake	*Merluccius merluccius*				
Thickback Sole	*Microchirus variegatus*				
Blue Whiting	*Micromesistius poutassou*				
Lemon Sole	*Microstomus kitt*		MA	-	B
Ling	*Molva molva*		MA	-	P

(Striped) red mullet	*Mullus surmuletus*		MA	-	B
Starry smooth hound	*Mustelus asterias*		MA	-	B
Smooth hound	*Mustelus mustelus*		MA	-	B
Bullrout / Short-spined sea scorpion/Shorthorn sculpin	*Myoxocephalus scorpius*	*	ER	-	P
Hagfish	*Myxine glutinosa*		MA	-	P
Worm pipefish	*Nerophis lumbriciformis*		ER	-	Z
Straightnose pipefish	*Nerophis ophidion*		ER	-	Z
Rainbow trout	*Oncorhynchus mykiss*		FW	-	P
European smelt	*Osmerus eperlanus*	*	CA	IND	Z
Blackspot seabream	*Pagellus bogaraveo*		MJ	-	B
Tompot blenny	*Parablennius gattorugine*		MA	-	B
Perch / European perch	*Perca fluviatilis*		FW	-	P
Sea lamprey	*Petromyzon marinus*		CA	IND	P
Lamprey sp.	*Petromyzontidae*		CA	-	P
Butterfish / Rock gunnel	*Pholis gunnellus*		ER	-	B
Minnow / Eurasian minnow	*Phoxinus phoxinus*		FW	-	Z
Norwegian topknot	*Phrynorhombus norvegicus*		MA	-	B
Flounder	*Platichthys flesus*	*	ER	-	B
Plaice / European plaice	*Pleuronectes platessa*	*	MJ	-	B
Right sided flatfish sp.	*Pleuronectidae*		-	-	B
Pollack	*Pollachius pollachius*	*	MJ	-	P
Saithe/Coalfish	*Pollachius virens*		MA	-	P
Lozano's goby	*Pomatoschistus lozanoi*		MA	-	B
Common goby	*Pomatoschistus microps*	*	ER	-	B
Sand goby	*Pomatoschistus minutus*	*	ER	-	B
Painted goby	*Pomatoschistus pictus*		MA	-	B
Goby sp.	*Pomatoschistus sp.*		MA		
Turbot	*Psetta maxima*		MS	-	P
Ninespine stickleback	*Pungitius pungitius*		CA	-	Z
Common skate	*Raja batis*				
Blonde ray	*Raja brachyura*				
Thornback ray	*Raja clavata*		MA	-	B
Painted ray / small eye ray	*Raja microocellata*		MA	-	P
Spotted ray	*Raja montagui*				
Tadpole fish	*Raniceps raninus*		ER	-	O
Roach	*Rutilus rutilus*		FW	-	Z
Roach x common bream hybrid	*Rutilus rutilus x Abramis brama*		FW	-	Z
Atlantic salmon	*Salmo salar*		CA	IND	P
Brown trout	*Salmo trutta*	*	FW	-	P
Sea trout	*Salmo trutta trutta*		CA	IND	P

Char	*Salvelinus alpinus alpinus*		CA	-	Z
European pilchard	*Sardina pilchardus*		MS	-	Z
Rudd	*Scardinius erythrophthalmus*		FW	-	B
Rudd x common bream hybrid	*Scardinius erythrophthalmus x Abramis brama*		FW	-	Z
Atlantic Mackerel	*Scomber scombrus*		MA	-	P
King gar	*Scomberesox saurus*				
Brill	*Scophthalmus rhombus*		MA	-	P
Turbot	*Scophthalmus maximus*				
Small-scaled Scorpionfish	*Scorpaena porcus*				
Brill	*Scyliorhinus canicula*		MA	-	P
Huss/ Smoothhound/ Nursehound/	*Scyliorhinus stellaris*		MA	-	B
Sand Sole	*Solea lascaris*		MA	-	B
Common sole / Dover sole	*Solea solea*	*	MJ	-	B
Gilthead bream	*Sparus aurata*		MA	-	P
Sea stickleback/Fifteen-spined stickleback	*Spinachia spinachia*	*	ER	-	Z
Black sea bream	*Spondyliosoma cantharus*		MJ	-	B
European sprat	*Sprattus sprattus*	*	MS	-	Z
Angelshark	*Squatina squatina*				
Corkwing wrasse	*Symphodus melops*		MA	-	B
Pipe fish & Sea horse sp.	*Syngnathidae*		ER	-	Z
Greater pipefish	*Syngnathus acus*	*	ER	-	Z
Nilsson's pipefish	*Syngnathus rostellatus*	*	ER	-	Z
Broad-nosed pipefish	*Syngnathus typhle*		ER	-	Z
Longspined bullhead	*Taurulus bubalis*		MA	-	B
Grayling	*Thymallus thymallus*		FW	-	B
Tench varieties	*Tinca tinca*		FW	-	B
Greater weever	*Trachinus draco*				
Atlantic horse mackerel/Scad	*Trachurus trachurus*		MA	-	P
Tub gurnard	*Trigla lucerna*		MJ	-	B
Gurnard sp.	*Triglidae*		-	-	B
Streaked gurnard	*Trigloporus lastoviza*				
Norway pout	*Trisopterus esmarkii*		MA	-	B
Pouting / Bib	*Trisopterus luscus*		MJ	-	B
Poor cod	*Trisopterus minutus*		MA	-	B
Topknot	*Zeugopterus punctatus*		MA	-	B
Dory	*Zeus faber*		MA	-	P
Viviparous blenny	*Zoarces viviparus*		ER	-	B
Column 4 - After Elliott & Dewailly (1995) & after appendix of Elliott & Hemingway (2002)					

Column 6 Feeding guilds were developed by Whitfield (1998) (Note: not all UK species were assigned guilds so expert judgement has been used)					

Table 12c: Reference condition data according to ecotype - Scotland

Column 1	Column 2	Column 3			Column 4	Column 5	Column 6
Common Name	**Scientific Name**	**Transitional water ecotype** (***** = *species listed in Column 1 and present in the type at reference conditions*)			**Functional Guilds:** **ER =** Estuarine resident taxa **FW =** Freshwater taxa **CA** Diadromous taxa **MS** Marine seasonal taxa **MJ** Marine juvenile taxa **MA** Marine adventitious taxa	**Indicator taxa (IND)**	**Feeding Guilds:** **B** Benthic invertebrate feeding taxa **Z** Zooplankton feeding taxa **P** Piscivorous feeding taxa **D** Detritus feeding taxa **O** Omnivorous feeding taxa
		SN2upp	*SN2mid*	**SN2lwr**			
Silver bream	*Abramis bjoerkna*				FW	-	B
Common bream/Bream	*Abramis brama*				FW	-	B
Sturgeon	*Acipenser sturio*				CA	IND	B
Hooknose/Pogge	*Agonus cataphractus*	*	*		ER	-	B
Bleak	*Alburnus alburnus*				FW	-	Z
Allis shad	*Alosa alosa*				CA	IND	Z
Twaite shad	*Alosa fallax*				CA	IND	Z
Lesser sand-eel/ Raitt's Sand-eel	*Ammodytes marinus*				MA	-	Z
Sandeel, Small sandeel	*Ammodytes tobianus*	*			ER	-	Z
Sand eel sp.	*Ammodytidae*				ER	-	Z

	Anarhichas lupus				MA		P
European eel	*Anguilla anguilla*		*	*	CA	IND	P
Transparent goby	*Aphia minuta*				ER	-	Z
Small-headed clingfish	*Apletodon microcephalus*				MA	-	B
Common argentine	*Argentina sphyraena*				MA	-	B
Meagre	*Argyrosomus regius*				MA	-	P
Scaldfish	*Arnoglossus laterna*				MA	-	B
(E.atlantic) Red gurnard	*Aspitrigla cuculus*				MA	-	B
Big-eyed Sand-smelt	*Atherina boyeri*				ER	-	P
Sand smelt	*Atherina presbyter*				MJ	-	Z
Stone loach	*Barbatula barbatula*				FW	-	B
Barbel	*Barbus barbus*				FW	-	B
Garfish	*Belone belone*				MS	-	P
Butterfly blennie	*Blennius ocellaris*				MA	-	B
Atlantic pomfret	*Brama brama*				MA		B
Solenette	*Buglossidium luteum*				MA	-	B
Dragonet	*Callionymus lyra*				MA	-	B
Spotted dragonet	*Callionymus maculatus*						
Reticulated dragonet	*Callionymus reticulatus*				MA	-	B
Goldfish varieties	*Carassius auratus*				FW	-	D
Rock cook	*Centrolabrus exoletus*						
Red bandfish	*Cepola rubescens*						
Tub gurnard	*Chelidonichthys lucernus*				MJ	-	B
Thicklip grey mullet	*Chelon labrosus*				MS	-	D
Fivebeard rockling	*Ciliata mustela*	*	*		MS	-	B
Northern rockling	*Ciliata septentrionalis*						
herring	*Clupea harengus*	*	*	*	MJ	-	Z
Herring like sp.	*Clupeidae*				MS	-	Z
European conger/Conger eel	*Conger conger*				MA	-	P
Pollan	*Coregonus autumnalis*				CA	-	B
Common whitefish/Powan	*Coregonus lavaretus*				ER	-	Z
Houting	*Coregonus oxyrinchus*				ER	-	Z

Montagu's Blenny	*Coryphoblennius galerita*						
Bullhead	*Cottus gobio*				FW	-	B
Corkwing wrasse	*Crenilabrus melops*				MA	-	B
Goldsinny-wrasse	*Ctenolabrus rupestris*				MA	-	B
Lumpsucker	*Cyclopterus lumpus*				MS	-	B
Common carp varieties	*Cyprinus carpio*				FW	-	B
Common stingray	*Dasyatis pastinaca*						
European seabass	*Dicentrarchus labrax*				MJ	-	P
Two-spotted clingfish	*Diplecogaster bimaculata*				ER	-	B
Lesser weever	*Echiichthys vipera*						
Four-bearded Rockling	*Enchelyopus cimbrius*				MA	-	B
European anchovy	*Engraulis encrasicolus*				MS	-	Z
Snake pipefish	*Entelurus aequoreus*				MA	-	Z
(northern) Pike	*Esox lucius*				FW	-	P
Grey gurnard	*Eutrigla gurnardus*				MS	-	B
Silvery cod	*Gadiculus argenteus argenteus*				MA	-	B
Atlantic cod	*Gadus morhua*	*	*	*	MJ	-	P
Shore rockling	*Gaidropsarus mediterraneus*				MA	-	B
Three-bearded rockling	*Gaidropsarus vulgaris*				MA	-	B
Three-spined stickleback	*Gasterosteus aculeatus*	*	*	*	CA	-	Z
Goby sp.	*Gobiidae*				ER	-	B
Gudgeon	*Gobio gobio*				FW	-	D
Giant goby	*Gobius cobitis*				MS	-	B
Black goby	*Gobius niger*				ER	-	B
Rock goby	*Gobius paganellus*				ER	-	B
Two-spotted goby	*Gobiusculus flavescens*	*			MA	-	B
Long-snouted seahorse	*Hippocampus guttulatus*				ER	-	Z
Short-snouted Seahorse	*Hippocampus hippocampus*				MA	-	Z
Long snouted Sea horse	*Hippocampus ramulosus*				ER	-	Z
Long rough dab	*Hippoglossoides platessoides*				MA	-	B
Atlantic halibut	*Hippoglossus hippoglossus*						

Greater sand-eel	*Hyperoplus immaculatus*				ER	-	B
Great sandeel	*Hyperoplus lanceolatus*				ER	-	B
Skipjack tuna	*Katsuwonus pelamis*				MS		P
Ballan wrasse	*Labrus bergylta*				MA	-	B
Cuckoo wrasse	*Labrus mixtus*				MA	-	B
European river lamprey	*Lampetra fluviatilis*		*		CA	IND	P
Brook lamprey	*Lampetra planeri*				FW	-	P
Shore Clingfish	*Lepadogaster lepadogaster*						
Megrim	*Lepidorhombus whiffiagonis*				MA	-	P
Chub	*Leuciscus cephalus*				FW	-	P
Common dace	*Leuciscus leuciscus*				FW	-	Z
Dab	*Limanda limanda*	*			MJ	-	B
Sea Snail/Striped seasnail	*Liparis liparis*				ER	-	B
Montagu's Sea Snail	*Liparis montagui*				MA	-	B
Shanny	*Lipophrys pholis*				MA	-	B
Golden grey mullet	*Liza aurata*				MS	-	D
Thin lipped grey mullet	*Liza ramada*				CA	-	D
Angler	*Lophius piscatorius*						
Snake blenny	*Lumpenus lumpretaeformis*				MA	-	B
Pearlsides	*Maurolicus muelleri*						
Haddock	*Melanogrammus aeglefinus*				MA		B
Whiting	*Merlangius merlangus*	*	*	*	MJ	-	P
Hake	*Merluccius merluccius*						
Thickback Sole	*Microchirus variegatus*						
Blue Whiting	*Micromesistius poutassou*						
Lemon Sole	*Microstomus kitt*				MA	-	B
Ling	*Molva molva*				MA	-	P
(Striped) red mullet	*Mullus surmuletus*				MA	-	B
Starry smooth hound	*Mustelus asterias*				MA	-	B
Smooth hound	*Mustelus mustelus*				MA	-	B

Bullrout / Short-spined sea scorpion/Shorthorn sculpin	*Myoxocephalus scorpius*	*	*	*	ER	-	P
Hagfish	*Myxine glutinosa*				MA	-	P
Worm pipefish	*Nerophis lumbriciformis*				ER	-	Z
Straightnose pipefish	*Nerophis ophidion*				ER	-	Z
Rainbow trout	*Oncorhynchus mykiss*				FW	-	P
European smelt	*Osmerus eperlanus*		*	*	CA	IND	Z
Blackspot seabream	*Pagellus bogaraveo*				MJ	-	B
Tompot blenny	*Parablennius gattorugine*				MA	-	B
Perch / European perch	*Perca fluviatilis*				FW	-	P
Sea lamprey	*Petromyzon marinus*				CA	IND	P
Lamprey sp.	*Petromyzontidae*				CA	-	P
Butterfish / Rock gunnel	*Pholis gunnellus*				ER	-	B
Minnow / Eurasian minnow	*Phoxinus phoxinus*				FW	-	Z
Norwegian topknot	*Phrynorhombus norvegicus*				MA	-	B
Flounder	*Platichthys flesus*	*			ER	-	B
Plaice / European plaice	*Pleuronectes platessa*	*	*	*	MJ	-	B
Right sided flatfish sp.	*Pleuronectidae*				-	-	B
Pollack	*Pollachius pollachius*	*	*		MJ	-	P
Saithe/Coalfish	*Pollachius virens*	*	*		MA	-	P
Lozano's goby	*Pomatoschistus lozanoi*				MA	-	B
Common goby	*Pomatoschistus microps*	*			ER	-	B
Sand goby	*Pomatoschistus minutus*		*	*	ER	-	B
Painted goby	*Pomatoschistus pictus*				MA	-	B
Goby sp.	*Pomatoschistus sp.*				MA		
Turbot	*Psetta maxima*				MS	-	P
Ninespine stickleback	*Pungitius pungitius*				CA	-	Z
Common skate	*Raja batis*						
Blonde ray	*Raja brachyura*						
Thornback ray	*Raja clavata*				MA	-	B
Painted ray / small eye ray	*Raja microocellata*				MA	-	P
Spotted ray	*Raja montagui*						
Tadpole fish	*Raniceps raninus*				ER	-	O
Roach	*Rutilus rutilus*				FW	-	Z
Roach x common bream hybrid	*Rutilus rutilus x Abramis brama*				FW	-	Z
Atlantic salmon	*Salmo salar*				CA	IND	P
Brown trout	*Salmo trutta*		*		FW	-	P
Sea trout	*Salmo trutta trutta*				CA	IND	P

Char	*Salvelinus alpinus alpinus*				CA	-	Z
European pilchard	*Sardina pilchardus*				MS	-	Z
Rudd	*Scardinius erythrophthalmus*				FW	-	B
Rudd x common bream hybrid	*Scardinius erythrophthalmus x Abramis brama*				FW	-	Z
Atlantic Mackerel	*Scomber scombrus*				MA	-	P
King gar	*Scomberesox saurus*						
Brill	*Scophthalmus rhombus*				MA	-	P
Turbot	*Scophthalmus maximus*						
Small-scaled Scorpionfish	*Scorpaena porcus*						
Brill	*Scyliorhinus canicula*				MA	-	P
Huss/ Smoothhound/ Nursehound/	*Scyliorhinus stellaris*				MA	-	B
Sand Sole	*Solea lascaris*				MA	-	B
Common sole / Dover sole	*Solea solea*				MJ	-	B
Gilthead bream	*Sparus aurata*				MA	-	P
Sea stickleback/Fifteen-spined stickleback	*Spinachia spinachia*	*	*		ER	-	Z
Black sea bream	*Spondyliosoma cantharus*				MJ	-	B
European sprat	*Sprattus sprattus*	*	*	*	MS	-	Z
Angelshark	*Squatina squatina*						
Corkwing wrasse	*Symphodus melops*				MA	-	B
Pipe fish & Sea horse sp.	*Syngnathidae*				ER	-	Z
Greater pipefish	*Syngnathus acus*	*	*		ER	-	Z
Nilsson's pipefish	*Syngnathus rostellatus*	*			ER	-	Z
Broad-nosed pipefish	*Syngnathus typhle*				ER	-	Z
Longspined bullhead	*Taurulus bubalis*				MA	-	B
Grayling	*Thymallus thymallus*				FW	-	B
Tench varieties	*Tinca tinca*				FW	-	B
Greater weever	*Trachinus draco*						
Atlantic horse mackerel/Scad	*Trachurus trachurus*				MA	-	P
Tub gurnard	*Trigla lucerna*				MJ	-	B
Gurnard sp.	*Triglidae*				-	-	B
Streaked gurnard	*Trigloporus lastoviza*						
Norway pout	*Trisopterus esmarkii*				MA	-	B
Pouting / Bib	*Trisopterus luscus*				MJ	-	B
Poor cod	*Trisopterus minutus*				MA	-	B
Topknot	*Zeugopterus punctatus*				MA	-	B
Dory	*Zeus faber*				MA	-	P
Viviparous blenny	*Zoarces viviparus*	*	*	*	ER	-	B
Column 4 - After Elliott & Dewailly (1995) & after appendix of Elliott & Hemingway (2002)							
Column 6 Feeding guilds were developed by Whitfield (1998)							
(Note: not all UK species were assigned guilds so expert judgement has been used)							

Table 13a: Relative abundance (%) of each taxon as a percentage of the total number of all fish taxa present at reference for each ecotype in England and Wales

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9
Fish Taxa	A1	A2	A3	A4	B2	B3	B4	Ria
Abramis bjoerkna	0.1123	0	0	0	0	0.027	0	0
Abramis brama	0.7189	0	0.0013	0	0	0.6022	0	0.0029
Agonus cataphractus	0.0599	0.0062	0.2235	0	2.8171	0.625	1.491	0.0087
Alburnus alburnus	0.0824	0	0	0	0	0.0555	0	0
Alosa fallax	0	0	0.0013	0	0	0.0014	0	0
Ammodytes tobianus	6.8144	9.7433	0.4484	2.6865	4.1036	0.9339	0	0.4488
Anguilla anguilla	0.2172	0.2041	0.1558	0	0.0266	0.3644	0.0792	0
Aphia minuta	0	0.0062	0.0013	0.0461	0	0.0028	0.0088	0.0029
Apletodon microcephalus	0	0	0	0	0	0	0	0.0014
Argentina sphyraena	0	0	0	0	0	0.0014	0	0
Arnoglossus laterna	0	0.0495	0.0026	0	0	0.0014	0	0
Aspitrigla cuculus	0	0.198	0	0	0	0.01	0.0022	0.0043
Atherina boyeri	0	0	0	0	0	0.2178	0	0
Atherina presbyter	1.6699	16.647	0.0562	30.68	0.0089	0.5424	8.227	22.787
Barbatula barbatula	0	0	0.0013	0	0	0	0	0
Barbus barbus	0	0	0.0013	0	0	0	0	0
Belone belone	0.0524	0.2598	0.0013	0.0384	0	0	0.0044	0.0072
Blennius ocellaris	0	0	0	0	0	0.0028	0	0
Buglossidium luteum	3.205	0	0.0945	0.0154	0	0.0043	0	0.0231
Callionymus lyra	0.0374	0.0186	0.037	0.0537	0.0089	0.1025	0.1429	0.0996
Callionymus reticulatus	0	0.0062	0	0.023	0	0.0028	0.0396	0
Carassius auratus	0.0075	0	0	0	0	0	0	0
Chelon labrosus	1.8571	0.1732	0.0319	2.8938	0	0.0228	0.1539	0.8991
Ciliata mustela	0	0	0.0332	0	0.2263	0.2306	0.3145	0.0072
Clupea harengus	4.7327	24.961	2.0017	11.268	2.3513	3.9633	2.7819	1.1805
Conger conger	0	0	0.0013	0	0	0	0	0
Cottus gobio	0	0.0062	0	0	0	0	0	0
Crenilabrus melops	0	0.0062	0.0013	0.3224	0	0.0014	0.044	0.0678
Ctenolabrus rupestris	0	0	0	0.0077	0	0	0	0.0231
Cyclopterus lumpus	0	0	0	0	0.0044	0	0	0
Cyprinus carpio	0	0	0.0013	0	0	0	0	0

Dicentrarchus labrax	12.019	1.3548	1.9199	20.441	0.0665	31.821	21.703	3.0596
Echiichthys vipera	0	0.2165	2.0247	0.023	0.1153	0.0527	0.0066	0.1299
Engraulis encrasicolus	0	0	0	0	0	0.0342	0.0176	0
Entelurus aequoreus	0	0	0	0.0077	0.1641	0.074	0.4706	0.0173
Esox lucius	0.0075	0	0.0013	0	0	0	0	0
Eutrigla gurnardus	0.3819	0.0124	0.0255	0	0	0.0114	0	0
Gadus morhua	0.8162	0.0186	0.3206	0	1.1756	2.0813	1.3745	0.0043
Gaidropsarus mediterraneus	0	0	0.0038	0	0	0	0	0
Gaidropsarus vulgaris	0	0	0.0013	0	0	0.0028	0	0
Gasterosteus aculeatus	0.1123	0.0124	0.2836	0.3684	2.5775	0.242	0.0044	0.0014
Gobio gobio	0.0599	0	0.0115	0	0.0133	0.0043	0	0
Gobius cobitis	0	0	0	0	0	0.0014	0.0264	0.0072
Gobius niger	0	0	0	0.1842	0	0.0641	0.1341	0.0188
Gobius paganellus	0	0	0.0013	0.0077	0	0.0014	0.0044	0.0014
Gobiusculus flavescens	0	0	0	0.6448	0	0	0.0374	0.0303
Hippocampus hippocampus	0	0	0	0.0077	0	0	0	0.0014
Hippocampus ramulosus	0	0	0	0.0154	0	0	0	0
Hippoglossoides platessoides	0	0	0	0	0	0	0.0022	0
Hyperoplus immaculatus	0	0	0.0026	0	0.3061	0	0	0
Hyperoplus lanceolatus	0.0674	0	0	0.0077	0.5767	0	0	0.088
Labrus bergylta	0.015	0.0124	0	0.023	0	0	0.0638	0.1385
Labrus mixtus	0	0	0	0	0	0	0	0.0072
Lampetra fluviatilis	0	0	0	0	0	0.0028	0	0
Lepidorhombus whiffiagonis	0.0225	0	0.0204	0	0	0	0	0.0087
Leuciscus cephalus	0.0374	0	0.0473	0	0.1198	0	0	0
Leuciscus leuciscus	0.5616	0.198	2.0872	0.0998	8.9836	2.5098	0	0
Limanda limanda	3.7592	0.4145	2.6123	0	0.4747	1.5104	0.4156	0
Liparis liparis	0	0	0.0179	0	0.0399	0.4314	0.0638	0.0014
Liparis montagui	0	0	0	0	0.0355	0	0.0022	0
Lipophrys pholis	0	0	0	0.0307	0	0	0.0022	0.0043
Liza aurata	3.0253	1.6455	0.0575	0.7062	0	0.0142	0.0264	0.7202
Liza ramada	6.2229	8.4071	3.4502	1.2665	0.0133	0.047	0.0594	2.5054
Lumpenus lumpretaeformis	0	0	0	0	0	0	0.0242	0
Merlangius merlangus	1.5801	0.1299	2.5905	0.0154	3.1454	7.8398	3.578	0
Microstomus kitt	0	0	0.0153	0	0	0.0014	0.0022	0
Molva molva	0	0	0	0	0	0.0014	0	0
Mullus surmuletus	0	0	0.0026	0	0	0.0327	0.0088	0.0173

Mustelus asterias	0	0	0	0.0154	0.0044	0	0	0
Myoxocephalus scorpius	0.0225	0	0.0102	0	0.3727	0.1281	0.0462	0.0043
Myxine glutinosa	0	0	0	0	0.0044	0	0	0
Nerophis lumbriciformis	0	0	0	0	0.0044	0	0	0
Nerophis ophidion	0	0	0.0128	0.0307	0	0.0014	0	0
Oncorhynchus mykiss	0	0	0	0	0	0	0	0.0014
Osmerus eperlanus	0.015	0	4.1017	0.0077	0.0044	1.5546	0.2243	0.4229
Parablennius gattorugine	0	0	0	0	0	0	0	0.0029
Perca fluviatilis	0.0599	0	0.1367	0	0	0.7616	0	0
Pholis gunnellus	0.015	0	0.0064	0	0.0355	0.0085	0.0066	0
Phoxinus phoxinus	0.0075	0.0309	4.2511	0	0.1863	0	0	0.0014
Phrynorhombus norvegicus	0	0	0	0	0	0	0	0.0014
Platichthys flesus	3.0777	6.1058	13.37	3.0243	9.414	14.37	1.2337	0.228
Pleuronectes platessa	0.996	1.4166	3.2088	0.8136	3.7576	1.5104	0.1517	0.1039
Pollachius pollachius	0.0449	0.0186	0.0945	0.1842	0.0843	0.0043	0	0.1299
Pollachius virens	0	0.0186	0	0	1.4463	0	0	0
Pomatoschistus lozanoi	0	0	0.0013	0.0154	0	0	0	0
Pomatoschistus microps	1.1307	1.1754	0.2644	9.4873	0.0222	1.8649	0.3783	2.1215
Pomatoschistus minutus	11.562	21.058	14.441	14.024	1.7701	9.961	41.186	11.407
Pomatoschistus pictus	0	0	0	0.1075	0	0.0014	0	0.0216
Psetta maxima	0	0	0.0013	0.0768	0	0.047	0	0
Pungitius pungitius	0.0075	0	0	0	0.0044	0.0057	0	0
Raja clavata	0.0973	0	0.0243	0	0	0.3801	0.5938	0.0043
Raja microocellata	0	0	0	0	0	0	0	0.0202
Rutilus rutilus	5.3317	0	0.1341	0.0154	0.0444	3.2401	0	0
Rutilus rutilus x Abramis brama	0.0599	0	0	0	0	0.0028	0	0
Salmo salar	0	0.0247	0.06	0	0.0665	0	0	0.0014
Salmo trutta	0.03	0.4021	0.5863	0.3147	0.2396	0	0	0.0144
Sardina pilchardus	0	0	0	0	0	0	0	30.954
Scardinius erythrophthalmus	0.0075	0	0	0	0	0.0028	0	0.0144
Scardinius erythrophthalmus x Abramis brama	0	0	0.0013	0	0	0	0	0
Scomber scombrus	0	0	0.0013	0	0.0044	0	0	0.0332
Scophthalmus rhombus	0	0.0062	0.0128	0	0	0.0584	0	0.0087
Scyliorhinus canicula	0.0749	0.0124	0.1035	0	0	0.1509	0.0352	0
Scyliorhinus stellaris	0	0.0062	0	0	0	0	0	0.0014
Solea lascaris	0	0	0.0077	0	0	0	0	0
Solea solea	0.0374	0.0124	1.0079	0	0.5324	5.8283	0.6685	0.0087

Sparus aurata	0	0	0	0	0	0	0	0.0014
Spinachia spinachia	0.0374	0.0124	0.0013	0	0.0044	0	0	0.0649
Spondyliosoma cantharus	0	0	0	0	0	0.0014	0	0
Sprattus sprattus	28.958	4.6891	39.197	0	53.494	1.9503	11.739	21.918
Syngnathus acus	0.1198	0.1856	0.0473	0	0.0355	0.1765	0.2507	0.0375
Syngnathus rostellatus	0	0.0186	0.0958	0	0.0444	0.027	0.0022	0.0173
Taurulus bubalis	0.015	0.0062	0.0077	0	0.6344	0.0256	0.044	0.0072
Thymallus thymallus	0	0	0.0013	0	0	0	0	0
Tinca tinca	0.015	0	0	0	0	0.0014	0	0
Trachurus trachurus	0	0	0	0	0	0.1295	0.1363	0.0837
Trigla lucerna	0.0225	0	0.0575	0	0	0.1495	0.0528	0.0231
Trisopterus luscus	0	0	0.1507	0	0.0089	3.0166	1.5416	0.013
Trisopterus minutus	0	0.0928	0.0089	0	0.0044	0.1267	0.3519	0
Zoarces viviparus	0	0	0	0	0.4215	0.0157	0.0396	0

Table 13b: Relative abundance (%) of each taxon as a percentage of the total number of all fish taxa present at reference for each ecotype in Northern Ireland

Column 1	**Column 2**
Fish taxa	NI 2
Abramis bjoerkna	0
Abramis brama	0
Agonus cataphractus	0
Alburnus alburnus	0
Alosa fallax	0
Ammodytes tobianus	2.50
Anguilla anguilla	3.71
Aphia minuta	0
Apletodon microcephalus	0
Argentina sphyraena	0
Arnoglossus laterna	0
Aspitrigla cuculus	0
Atherina boyeri	0
Atherina presbyter	1.45
Barbatula barbatula	0
Barbus barbus	0
Belone belone	0

Blennius ocellaris	0
Buglossidium luteum	0
Callionymus lyra	0
Callionymus reticulatus	0
Carassius auratus	0
Chelon labrosus	2.60
Ciliata mustela	2.19
Clupea harengus	2.36
Conger conger	0
Cottus gobio	0
Crenilabrus melops	0
Ctenolabrus rupestris	0
Cyclopterus lumpus	0
Cyprinus carpio	0
Dicentrarchus labrax	0
Echiichthys vipera	0
Engraulis encrasicolus	0
Entelurus aequoreus	0
Esox lucius	0
Eutrigla gurnardus	0
Gadus morhua	0.52
Gaidropsarus mediterraneus	0
Gaidropsarus vulgaris	0
Gasterosteus aculeatus	2.45
Gobio gobio	0
Gobius cobitis	0
Gobius niger	0.51
Gobius paganellus	0
Gobiusculus flavescens	1.51
Hippocampus hippocampus	0
Hippocampus ramulosus	0
Hippoglossoides platessoides	0
Hyperoplus immaculatus	0
Hyperoplus lanceolatus	0
Labrus bergylta	0
Labrus mixtus	0
Lampetra fluviatilis	0

Lepidorhombus whiffiagonis	0
Leuciscus cephalus	0
Leuciscus leuciscus	0
Limanda limanda	0.36
Liparis liparis	0
Liparis montagui	0
Lipophrys pholis	0
Liza aurata	0
Liza ramada	0
Lumpenus lumpretaeformis	0
Merlangius merlangus	1.62
Microstomus kitt	0
Molva molva	0
Mullus surmuletus	0
Mustelus asterias	0
Myoxocephalus scorpius	0
Myxine glutinosa	0
Nerophis lumbriciformis	0
Nerophis ophidion	0
Oncorhynchus mykiss	0
Osmerus eperlanus	0.79
Parablennius gattorugine	0
Perca fluviatilis	0
Pholis gunnellus	0
Phoxinus phoxinus	0.33
Phrynorhombus norvegicus	0
Platichthys flesus	14.80
Pleuronectes platessa	1.95
Pollachius pollachius	0.74
Pollachius virens	0
Pomatoschistus lozanoi	0
Pomatoschistus microps	10.22
Pomatoschistus minutus	20.66
Pomatoschistus pictus	0
Psetta maxima	0
Pungitius pungitius	0
Raja clavata	0

Raja microocellata	0
Rutilus rutilus	0.78
Rutilus rutilus x Abramis brama	0
Salmo salar	0
Salmo trutta	0.40
Sardina pilchardus	0
Scardinius erythrophthalmus	0
Scardinius erythrophthalmus x Abramis brama	0
Scomber scombrus	0
Scophthalmus rhombus	0
Scyliorhinus canicula	0
Scyliorhinus stellaris	0
Solea lascaris	0
Solea solea	0
Sparus aurata	0
Spinachia spinachia	0.71
Spondyliosoma cantharus	0
Sprattus sprattus	23.52
Syngnathus acus	0
Syngnathus rostellatus	0
Taurulus bubalis	0
Thymallus thymallus	0
Tinca tinca	0
Trachurus trachurus	0
Trigla lucerna	0
Trisopterus luscus	0
Trisopterus minutus	0
Zoarces viviparus	0

Table 13c: Relative abundance (%) of each taxon as a percentage of the total number of all fish taxa present at reference for each ecotype in Scotland

Column 2	Column 3	Column 4	Column 5
Scientific Name	**SN2lwr**	**SN2mid**	**SN2upp**
Abramis bjoerkna	0.00	0.00	0.00
Abramis brama	0.00	0.00	0.00
Agonus cataphractus	4.76	5.26	0.00
Alburnus alburnus	0.00	0.00	0.00
Alosa fallax	0.00	0.00	0.00
Ammodytes tobianus	4.76	0.00	0.00
Anguilla anguilla	0.00	5.26	9.09
Aphia minuta	0.00	0.00	0.00
Apletodon microcephalus	0.00	0.00	0.00
Argentina sphyraena	0.00	0.00	0.00
Arnoglossus laterna	0.00	0.00	0.00
Aspitrigla cuculus	0.00	0.00	0.00
Atherina boyeri	0.00	0.00	0.00
Atherina presbyter	0.00	0.00	0.00
Barbatula barbatula	0.00	0.00	0.00
Barbus barbus	0.00	0.00	0.00
Belone belone	0.00	0.00	0.00
Blennius ocellaris	0.00	0.00	0.00
Buglossidium luteum	0.00	0.00	0.00
Callionymus lyra	0.00	0.00	0.00
Callionymus reticulatus	0.00	0.00	0.00
Carassius auratus	0.00	0.00	0.00
Chelon labrosus	0.00	0.00	0.00
Ciliata mustela	4.76	5.26	0.00
Clupea harengus	4.76	5.26	9.09
Conger conger	0.00	0.00	0.00
Cottus gobio	0.00	0.00	0.00
Crenilabrus melops	0.00	0.00	0.00
Ctenolabrus rupestris	0.00	0.00	0.00
Cyclopterus lumpus	0.00	0.00	0.00

Cyprinus carpio	0.00	0.00	0.00
Dicentrarchus labrax	0.00	0.00	0.00
Echiichthys vipera	0.00	0.00	0.00
Engraulis encrasicolus	0.00	0.00	0.00
Entelurus aequoreus	0.00	0.00	0.00
Esox lucius	0.00	0.00	0.00
Eutrigla gurnardus	0.00	0.00	0.00
Gadus morhua	4.76	5.26	9.09
Gaidropsarus mediterraneus	0.00	0.00	0.00
Gaidropsarus vulgaris	0.00	0.00	0.00
Gasterosteus aculeatus	4.76	5.26	9.09
Gobio gobio	0.00	0.00	0.00
Gobius cobitis	0.00	0.00	0.00
Gobius niger	0.00	0.00	0.00
Gobius paganellus	0.00	0.00	0.00
Gobiusculus flavescens	4.76	0.00	0.00
Hippocampus hippocampus	0.00	0.00	0.00
Hippocampus ramulosus	0.00	0.00	0.00
Hippoglossoides platessoides	0.00	0.00	0.00
Hyperoplus immaculatus	0.00	0.00	0.00
Hyperoplus lanceolatus	0.00	0.00	0.00
Labrus bergylta	0.00	0.00	0.00
Labrus mixtus	0.00	0.00	0.00
Lampetra fluviatilis	0.00	5.26	0.00
Lepidorhombus whiffiagonis	0.00	0.00	0.00
Leuciscus cephalus	0.00	0.00	0.00
Leuciscus leuciscus	0.00	0.00	0.00
Limanda limanda	4.76	0.00	0.00
Liparis liparis	0.00	0.00	0.00
Liparis montagui	0.00	0.00	0.00
Lipophrys pholis	0.00	0.00	0.00
Liza aurata	0.00	0.00	0.00
Liza ramada	0.00	0.00	0.00
Lumpenus lumpretaeformis	0.00	0.00	0.00
Merlangius merlangus	4.76	5.26	9.09
Microstomus kitt	0.00	0.00	0.00
Molva molva	0.00	0.00	0.00

Mullus surmuletus	0.00	0.00	0.00
Mustelus asterias	0.00	0.00	0.00
Myoxocephalus scorpius	4.76	5.26	9.09
Myxine glutinosa	0.00	0.00	0.00
Nerophis lumbriciformis	0.00	0.00	0.00
Nerophis ophidion	0.00	0.00	0.00
Oncorhynchus mykiss	0.00	0.00	0.00
Osmerus eperlanus	0.00	5.26	9.09
Parablennius gattorugine	0.00	0.00	0.00
Perca fluviatilis	0.00	0.00	0.00
Pholis gunnellus	4.76	0.00	0.00
Phoxinus phoxinus	0.00	0.00	0.00
Phrynorhombus norvegicus	0.00	0.00	0.00
Platichthys flesus	4.76	0.00	0.00
Pleuronectes platessa	4.76	5.26	9.09
Pollachius pollachius	4.76	5.26	0.00
Pollachius virens	4.76	5.26	0.00
Pomatoschistus lozanoi	0.00	0.00	0.00
Pomatoschistus microps	4.76	0.00	0.00
Pomatoschistus minutus	0.00	5.26	9.09
Pomatoschistus pictus	0.00	0.00	0.00
Psetta maxima	0.00	0.00	0.00
Pungitius pungitius	0.00	0.00	0.00
Raja clavata	0.00	0.00	0.00
Raja microocellata	0.00	0.00	0.00
Rutilus rutilus	0.00	0.00	0.00
Rutilus rutilus x Abramis brama	0.00	0.00	0.00
Salmo salar	0.00	0.00	0.00
Salmo trutta	0.00	5.26	0.00
Sardina pilchardus	0.00	0.00	0.00
Scardinius erythrophthalmus	0.00	0.00	0.00
Scardinius erythrophthalmus x Abramis brama	0.00	0.00	0.00
Scomber scombrus	0.00	0.00	0.00
Scophthalmus rhombus	0.00	0.00	0.00
Scyliorhinus canicula	0.00	0.00	0.00
Scyliorhinus stellaris	0.00	0.00	0.00
Solea lascaris	0.00	0.00	0.00

Solea solea	0.00	0.00	0.00
Sparus aurata	0.00	0.00	0.00
Spinachia spinachia	4.76	5.26	0.00
Spondyliosoma cantharus	0.00	0.00	0.00
Sprattus sprattus	4.76	5.26	9.09
Syngnathus acus	4.76	5.26	0.00
Syngnathus rostellatus	4.76	0.00	0.00
Taurulus bubalis	0.00	0.00	0.00
Thymallus thymallus	0.00	0.00	0.00
Tinca tinca	0.00	0.00	0.00
Trachurus trachurus	0.00	0.00	0.00
Trigla lucerna	0.00	0.00	0.00
Trisopterus luscus	0.00	0.00	0.00
Trisopterus minutus	0.00	0.00	0.00
Zoarces viviparus	4.76	5.26	9.09

Annex B: Typology for transitional water bodies in Scotland which can be classified using the TFCI

Water Body Name	UK Marine Typology
Upper Tay Estuary	TW2
Tyne Estuary	TW2
Don Estuary	TW2
Deveron Estuary	TW2
Ayr Estuary	TW2
Upper Forth Estuary	TW2
Lower Tay Estuary	TW2
Ythan Estuary	TW2
Spey Estuary	TW2
Middle Forth Estuary	TW2
Dornoch Firth	TW2
Montrose Basin	TW2
Clyde Estuary - Outer	TW2
Outer Cromarty Firth	TW2
Dee (Aberdeen) Estuary	TW2
Piltanton and Luce Estuary	TW2
Stinchar Estuary	TW2
Girvan Estuary	TW2
Garnock/ Irvine Estuary	TW2
Lower Forth Estuary	TW2
Lossie Estuary	TW2
Strathbeg Estuary	TW2
Inner Cromarty Firth	TW2
Beauly Firth	TW2
Ugie Estuary	TW2
Moray Firth	TW2
Clyde Estuary Inner	TW2
Eden Estuary	TW2
Upper Tay Estuary	TW2
Tyne Estuary	TW2
Don Estuary	TW2
Deveron Estuary	TW2
Ayr Estuary	TW2
Bladnoch and Cree Estuary (Outer)	TW3
Annan Estuary	TW3

Dee (Kirkcudbright) Estuary	TW3
Solway Estuary	TW3
Cree Estuary	TW3
Nith Estuary	TW3
Fleet Estuary	TW3
Auchencairn Bay	TW3
Southwick Estuary	TW3

Annex C: The typology of transitional water bodies in England & Wales which can be classified using the TFCI

Water Body Name	UK Marine Typology	Ria
ADUR	TW1	
AFAN	TW1	
ARUN	TW1	
CLYWD	TW1	
CONWY	TW1	
CUCKMERE	TW1	
GANNEL	TW1	
NEATH	TW1	
OGMORE	TW1	
OUSE	TW1	
PARRETT	TW1	
ROTHER	TW1	
TAW / TORRIDGE	TW1	√
TAWE	TW1	
ALN	TW2	
AVON	TW2	
AXE	TW2	
BLYTH (N)	TW2	
BLYTH (S)	TW2	
BURE & WAVENEY & YARE & LOTHING	TW2	
BURN & MOW & OVERY & NORTON	TW2	
COQUET	TW2	
DART	TW2	√
DYFI & LERI	TW2	
DYSYNNI	TW2	
DWYFOR	TW2	
ERME	TW2	√
ESK (E)	TW2	
EXE	TW2	
FOWEY	TW2	√
GLASLYN	TW2	
MAWDDACH	TW2	
NYFER	TW2	
OTTER	TW2	
TEIFI	TW2	

TEIGN	TW2	√
TEES	TW2	
TWEED	TW2	
TYNE	TW2	
WANSBECK	TW2	
WEAR	TW2	
WEY	TW2	
YSTWYTH / RHEIDOL	TW2	
ALT	TW3	
BRISTOL AVON	TW3	
CAMEL	TW3	√
DEE (N. WALES)	TW3	
DERWENT	TW3	
DUDDON	TW3	
ESK (W)	TW3	
GREAT OUSE	TW3	
HAYLE	TW3	
HUMBER LOWER	TW3	
HUMBER MIDDLE	TW3	
HUMBER UPPER	TW3	
KENT	TW3	
LEVEN	TW3	
LOUGHOR	TW3	
LUNE	TW3	
MARYPORT	TW3	
MEDWAY	TW3	
MERSEY	TW3	
MILFORD HAVEN INNER	TW3	√
NENE	TW3	
POW / ROTTINGTON	TW3	
RIBBLE	TW3	
SEVERN LOWER	TW3	
SEVERN MIDDLE	TW3	
SEVERN UPPER	TW3	
SOLWAY	TW3	
SWALE	TW3	
THAMES LOWER	TW3	
THAMES MIDDLE	TW3	
THAMES UPPER	TW3	

TYWI & CYWYN & GWENDRAETH	TW3	
USK	TW3	
STEEPING	TW3	
WASH INNER	TW3	
WELLAND	TW3	
WITHAM	TW3	
WYE	TW3	
WYRE	TW3	
ALAW	TW4	
ALDE & ORE	TW4	
ATRO	TW4	
BEAULIEU RIVER	TW4	
BLACKWATER & COLNE	TW4	
BRAINT	TW4	
CARRICK ROADS INNER	TW4	√
CEFNI	TW4	
CHICHESTER HARBOUR EAST	TW4	
CHRISTCHURCH HARBOUR	TW4	
CROUCH	TW4	
DEBEN	TW4	
EASTERN YAR	TW4	
ERCH	TW4	
FFRAW	TW4	
FORYD BAY	TW4	
GWAUN	TW4	
HAMFORD WATER	TW4	
HELFORD	TW4	√
KINGSBRIDGE	TW4	√
LOOE	TW4	
LYMINGTON	TW4	
MEDINA	TW4	
NEWTOWN RIVER	TW4	
ORWELL	TW4	
PLYMOUTH SOUND	TW4	√
POOLE HARBOUR	TW4	
SEIONT	TW4	
SOLFACH	TW4	
SOUTHAMPTON WATER	TW4	
STIFFKEY/ GLAVEN	TW4	

STOUR (ESSEX)	TW4	
STOUR (KENT)	TW4	
WALLINGTON	TW4	
WESTERN YAR	TW4	
WOOTTON CREEK	TW4	
YEALM	TW4	√

ANNEX D: Typology for transitional water bodies in Northern Ireland which can be classified using the TFCI

Water Body Name	UK Marine Typology
Foyle/Faughan Estuary	TW2
Roe Estuary	TW2
Bann Estuary	TW2
Connswater Estuary	TW2
Lagan Estuary	TW2
Newry Estuary	TW2

Annex E: Further Reading

CEN (2005) DIN EN 14757 Water quality - Sampling of fish with multi-mesh gillnets.

CEN (2006) CEN EN 14962 Water quality - Guidance on the scope and selection of fish sampling methods.

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